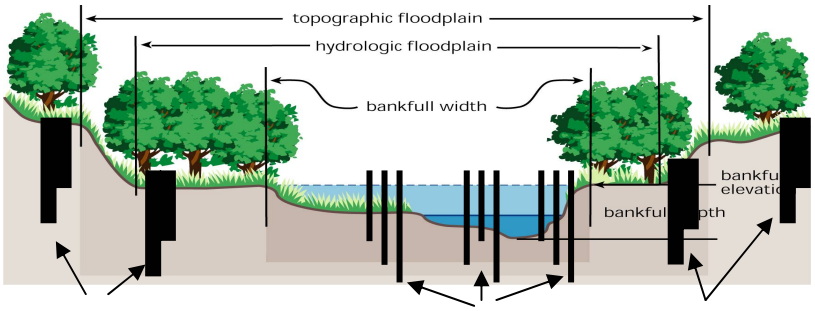

Project Title: **"EFFECTS OF ECOSYSTEM RESTORATION ON WATER QUALITY IN AN URBAN STREAM"**

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Collaborators: US Geological Survey, Institute of Ecosystem Studies, Maryland Department of Natural Resources, Baltimore County of Environmental Protection and Resource Management

Introduction to the problem: Nitrate (NO_3^-) is a pollutant that threatens ecosystem and human health. Restoring ecological condition of streams may be a cost-effective means to reduce nitrate pollution in watersheds.

Background: Minebank Run, an urban stream in Baltimore MD, will be restored in 2004 to improve geomorphic stability. Restoration will include reshaping stream banks to reconnect stream channel to flood plain, stream bank reinforcement, reconstructing stream meander features and riffle zones, and re-establishing riparian plant communities (above left).

Objectives: 1) Assess ecosystem benefits of restoration, 2) Identify stream restoration methods that enhance nitrate control, 3) Develop predictive models of stream hydrology (below left), 4) Develop ecologically-based guidelines for stream restoration, 5) Assess effects of stream restoration on fish and aquatic invertebrate communities.

Approach: Examine an urban stream before and after restoration to measure and identify limits to microbial denitrification, a natural process occurring in soils and groundwater that removes significant amounts of nitrate in waters by transformation to a biologically inactive gas form. Denitrification occurs under anaerobic conditions (e.g. saturated soils) and is limited by supply of dissolved organic carbon (DOC) to microbes. Restoration may enhance denitrification by reestablishing flood plain hydrology and/or increasing carbon availability. Identifying stream features where high denitrification activity occurs may provide important nitrate reduction tools and direct future restoration efforts (below right). Lab and field-based research will be conducted collaboratively among scientists from EPA, USGS, Baltimore County Dept. of Environmental Protection, USFS, Institute for Ecosystem Studies, Maryland Dept. of Natural Resources, and Maryland State Universities. We will 1) monitor surface and ground water quality and characterize hydrology by establishing an extensive network of wells and peizometers (above right), 2) quantify denitrification activity in situ and in the lab, and 3) measure carbon supply and retention of various stream features.

Accomplishments to date (24 Feb 2003): Completed seismic refraction tests and modeled subsurface lithology. Established stream flow gages and weather station. Conducted reconnaissance of ground water to characterize geochemistry in watershed. Installed a network of 72 wells and peizometers in restored and degraded reaches of Minebank Run. Characterize ground water and surface water samples for nitrate, chloride, DOC, pH, DO, and specific conductance. Collect real-time data on water levels in wells with automated logging devices. Extracted soil cores to assess lithology and measure C content. Measured denitrification potential of soil cores samples associated with saturated, riparian zone. Measured organic matter accumulation and associated denitrification potential in a variety of stream features. Installed scour chains and pins to assess erosion dynamics and sediment movement.

Near future tasks: Develop UV absorbance method and stable isotope approach for identifying DOC and nitrate origin. Characterize soil core lithology. Measure organic matter and particle size distribution among soil cores collected at various stream features within restored and unrestored reaches of Minebank Run. Conduct in situ tests of denitrification. Conduct tracer tests to assess hyporheic zone flow. Aerial photos of stream channel. Collect fish and invertebrates.